

C-2 Report on Multiple Discrete Returns

The USGS Lidar Base Specification Version 1.3 states: "Deriving and delivering multiple discrete returns is required in all conventional lidar data collection efforts. Data collection shall be capable of at least three returns per pulse. Full waveform collection is acceptable and is promoted; however, full waveform data are regarded as supplemental information."

The purpose of this section is to report on the presence and quantities of lidar returns in the LAS data. Empty return columns can indicate a collection or processing problem dealing with lidar return attribute information.

[Data Source - Y:\Mapping\Projects\65220171_USGS-TX_West_Texas\Production\Final_Client_Deliverables\Lot9_utm13\point_cloud\Swaths](#)

File	First return	Second return	Third return	Other returns	Total points
CS_02002.las	17,489,357	360,398	7,510	92	17,857,357
CS_02029.las	90,397,052	2,281,749	68,436	2,065	92,749,302
CS_02038.las	365,129,079	4,660,571	52,895	295	369,842,840
CS_02067.las	48,561,558	2,640,607	199,684	6,082	51,407,931
CS_02070.las	94,473,330	1,593,995	49,619	1,719	96,118,663
CS_02087.las	547,712,918	14,325,251	438,631	1,792	562,478,592
CS_02097.las	5,170	05	00	00	5,175
CS_02112.las	1,696,908	79,962	158	00	1,777,028
CS_02113.las	85,464,252	1,555,397	4,519	00	87,024,168
CS_02115.las	750,890,635	8,335,008	87,447	1,068	759,314,158
CS_02117.las	727,908,407	7,560,583	40,418	219	735,509,627
CS_02122.las	94,322,556	5,283,037	468,823	29,496	100,103,912
CS_02123.las	93,809,737	15,497,851	2,401,454	212,908	111,921,950
CS_02125.las	51,986,287	2,153,068	132,968	4,432	54,276,755
CS_02126.las	85,479,660	2,003,383	68,476	2,648	87,554,167
CS_02129.las	90,735,872	1,580,791	26,721	519	92,343,903
CS_02137.las	10,510,799	573,981	12,116	35	11,096,931
CS_02146.las	536,673,010	17,251,019	469,881	1,325	554,395,235
CS_02163.las	563,855	10,147	89	00	574,091
CS_02170.las	83,142,382	4,281,463	458,419	26,650	87,908,914
CS_02175.las	8,219,779	226,088	329	00	8,446,196
CS_02176.las	87,213,113	1,611,490	5,454	01	88,830,058
CS_02178.las	162,399,100	507,579	12,496	213	162,919,388
CS_02180.las	745,800,536	9,451,136	54,967	215	755,306,854
CS_02186.las	85,312,582	6,139,278	616,470	40,666	92,108,996

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File	First return	Second return	Third return	Other returns	Total points
CS_02187.las	90,630,673	12,996,048	2,004,065	189,781	105,820,567
CS_02188.las	86,434,047	14,561,779	3,015,694	324,286	104,335,806
CS_02189.las	91,643,519	16,623,413	4,055,835	481,788	112,804,555
CS_02193.las	95,113,925	1,849,193	48,068	1,440	97,012,626
CS_02197.las	87,163,967	1,445,026	22,658	501	88,632,152
CS_02214.las	556,848,854	11,252,115	191,044	335	568,292,348
CS_02215.las	560,230,770	18,524,609	556,304	2,158	579,313,841
CS_02240.las	91,785,535	4,184,670	457,965	25,528	96,453,698
CS_02245.las	16,272,711	195,184	180	00	16,468,075
CS_02247.las	113,060,415	1,872,579	6,953	04	114,939,951
CS_02251.las	719,443,350	8,644,778	63,365	289	728,151,782
CS_02257.las	92,242,653	7,454,228	771,099	45,068	100,513,048
CS_02258.las	96,882,750	10,178,290	1,372,747	120,246	108,554,033
CS_02259.las	107,713,723	18,969,898	4,209,253	469,098	131,361,972
CS_02260.las	91,732,222	17,616,932	4,360,925	518,810	114,228,889
CS_02264.las	82,705,196	1,319,123	27,362	976	84,052,657
CS_02268.las	82,054,602	1,467,287	31,853	921	83,554,663
CS_02277.las	145,802,238	3,729,253	68,162	182	149,599,835
CS_02287.las	541,455,762	12,207,952	250,169	583	553,914,466
CS_02288.las	552,646,535	17,412,979	515,614	1,992	570,577,120
CS_02310.las	83,371,877	4,419,865	482,714	27,829	88,302,285
CS_02313.las	23,573,190	170,350	296	00	23,743,836
CS_02315.las	120,061,417	1,926,344	6,716	06	121,994,483
CS_02318.las	712,243,049	7,952,506	70,105	411	720,266,071
CS_02324.las	86,306,386	9,720,016	1,258,607	82,536	97,367,545
CS_02325.las	90,552,454	6,659,659	830,332	65,000	98,107,445
CS_02327.las	88,571,866	18,322,143	4,448,491	495,061	111,837,561
CS_02331.las	94,045,987	1,815,781	39,043	1,067	95,901,878
CS_02334.las	630,617,123	5,724,848	49,014	393	636,391,378
CS_02344.las	136,684,601	4,244,829	102,914	287	141,032,631
CS_02346.las	372,406,548	6,206,503	67,020	322	378,680,393
CS_02353.las	103,721,570	3,580,130	70,218	203	107,372,121
CS_02354.las	551,645,760	14,787,740	465,732	2,234	566,901,466
CS_02358.las	547,113,394	14,034,960	274,809	861	561,424,024

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File	First return	Second return	Third return	Other returns	Total points
CS_02365.las	43,053,056	9,963,117	736,138	10,079	53,762,390
CS_02369.las	86	00	00	00	86
CS_02370.las	616,644,529	10,724,638	179,160	562	627,548,889
CS_02373.las	88,397,329	4,757,101	472,301	26,850	93,653,581
CS_02376.las	38,785,367	448,656	1,294	01	39,235,318
CS_02378.las	156,663,939	2,067,471	6,954	03	158,738,367
CS_02387.las	97,001,264	12,831,799	1,754,030	114,066	111,701,159
CS_02388.las	92,560,457	5,099,570	590,327	43,058	98,293,412
CS_02390.las	91,715,581	20,917,843	5,281,700	622,239	118,537,363
CS_02394.las	86,698,322	2,198,802	57,702	1,688	88,956,514
CS_02396.las	646,926,696	6,234,988	67,520	771	653,229,975
CS_02404.las	208,427,120	5,615,175	102,895	267	214,145,457
CS_02407.las	426,913,155	6,305,013	75,884	511	433,294,563
CS_02417.las	541,373,315	15,247,436	327,366	936	556,949,053
CS_02425.las	230,038,441	27,872,347	1,888,736	22,861	259,822,385
CS_02431.las	569,168,651	10,765,434	183,259	417	580,117,761
CS_02436.las	48,886,764	735,499	6,330	16	49,628,609
CS_02438.las	146,870,277	1,727,345	6,239	01	148,603,862
CS_02446.las	85,810,605	11,229,860	1,520,750	93,906	98,655,121
CS_02447.las	89,006,706	4,456,763	556,051	40,085	94,059,605
CS_02450.las	30,210,026	639,348	4,750	20	30,854,144
CS_02454.las	612,568,256	5,564,307	64,686	1,173	618,198,422
CS_02463.las	192,968,606	3,945,284	76,162	317	196,990,369
CS_02465.las	58,946,429	566,643	4,737	73	59,517,882
CS_02466.las	375,947,615	6,400,047	91,311	579	382,439,552
CS_02474.las	551,553,697	17,435,768	575,728	3,505	569,568,698
CS_02475.las	536,469,512	10,689,930	171,468	728	547,331,638
CS_02483.las	314,549,565	25,874,491	1,673,689	17,135	342,114,880
CS_02488.las	612,225,951	14,418,447	338,472	1,276	626,984,146
CS_02491.las	84,324,125	3,887,008	301,117	15,127	88,527,377
CS_02494.las	59,301,979	999,468	7,730	20	60,309,197
CS_02496.las	178,204,729	1,854,797	6,551	11	180,066,088
CS_02505.las	98,326,877	10,908,663	1,550,513	93,441	110,879,494
CS_02506.las	92,931,613	4,217,475	602,009	52,110	97,803,207

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CS_02511.las	406,508,960	2,828,342	20,458	98	409,357,858
CS_02512.las	640,809,882	5,214,953	52,039	1,275	646,078,149
CS_02513.las	605,085,847	5,714,756	38,452	445	610,839,500
CS_02517.las	592,509,311	7,047,887	66,270	600	599,624,068
CS_02520.las	231,221,102	3,871,471	62,733	330	235,155,636
CS_02522.las	476,684,246	7,742,511	74,688	384	484,501,829
CS_02523.las	379,619,081	9,154,916	185,355	1,577	388,960,929
CS_02530.las	541,744,203	17,343,827	532,548	2,978	559,623,556
CS_02531.las	392,047,538	7,807,096	165,238	1,507	400,021,379
CS_02539.las	312,732,391	20,053,319	1,208,134	10,093	334,003,937
CS_02544.las	565,201,743	15,935,622	409,841	2,776	581,549,982
CS_02547.las	89,541,035	3,631,732	200,799	8,169	93,381,735
CS_02550.las	62,839,047	927,155	5,126	08	63,771,336
CS_02552.las	154,783,586	1,552,780	4,733	08	156,341,107
CS_02553.las	86,038,723	5,693,565	687,845	42,706	92,462,839
CS_02555.las	146,035,456	21,518,888	2,465,513	75,683	170,095,540
CS_02561.las	85,455,163	8,304,874	1,235,229	79,366	95,074,632
CS_02562.las	88,295,324	6,225,855	1,021,176	90,677	95,633,032
CS_02566.las	90,673,657	2,503,489	112,128	5,906	93,295,180
CS_02567.las	610,546,808	4,599,364	34,831	142	615,181,145
CS_02569.las	617,221,414	5,590,050	35,693	363	622,847,520
CS_02573.las	637,177,613	8,301,131	83,836	849	645,563,429
CS_02577.las	441,395,685	7,533,834	71,194	446	449,001,159
CS_02578.las	213,855,005	5,529,043	96,809	712	219,481,569
CS_02584.las	560,404,107	19,020,807	646,270	4,119	580,075,303
CS_02585.las	46,721,461	1,195,371	32,915	295	47,950,042
CS_02589.las	593,220,874	6,989,986	415,057	7,172	600,633,089
CS_02592.las	311,616,379	17,528,500	1,113,639	10,270	330,268,788
CS_02599.las	8,564,763	64,224	314	01	8,629,302
CS_02602.las	67,930,986	814,605	3,324	02	68,748,917
CS_02604.las	498,014,683	5,498,842	67,145	563	503,581,233
CS_02605.las	86,247,855	5,108,697	555,755	35,152	91,947,459
CS_02607.las	139,525,527	21,194,852	2,432,107	74,028	163,226,514
CS_02613.las	92,662,972	11,287,145	1,813,464	131,023	105,894,604

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CS_02614.las	90,927,777	8,105,521	1,478,341	139,117	100,650,756
CS_02617.las	84,417,162	1,795,030	50,791	1,550	86,264,533
CS_02618.las	613,756,078	5,237,835	49,439	318	619,043,670
CS_02619.las	614,877,695	4,783,219	45,140	534	619,706,588
CS_02620.las	615,446,784	6,002,475	45,076	592	621,494,927
CS_02624.las	615,877,652	7,853,776	66,745	537	623,798,710
CS_02628.las	481,801,885	8,960,282	138,888	2,099	490,903,154
CS_02629.las	2,125,318	19,694	94	00	2,145,106
CS_02634.las	546,216,761	14,958,422	428,841	2,270	561,606,294
CS_02638.las	574,548,248	2,958,724	76,970	640	577,584,582
CS_02641.las	306,149,289	16,493,449	1,007,546	10,166	323,660,450
CS_02647.las	555,564,815	20,243,622	443,485	1,239	576,253,161
CS_02651.las	59,058,287	634,035	1,908	01	59,694,231
CS_02652.las	95,875,093	3,000,293	65,930	1,477	98,942,793
CS_02655.las	142,361,894	23,046,315	2,788,407	91,901	168,288,517
CS_02661.las	87,280,965	12,957,152	1,893,362	143,460	102,274,939
CS_02662.las	88,816,169	9,070,422	1,635,108	149,988	99,671,687
CS_02666.las	696,921,153	5,430,695	39,573	146	702,391,567
CS_02667.las	623,451,378	5,103,332	56,520	714	628,611,944
CS_02668.las	605,926,290	5,850,156	45,328	764	611,822,538
CS_02672.las	634,671,853	7,854,140	58,469	395	642,584,857
CS_02676.las	459,089,400	14,033,590	1,265,982	84,208	474,473,180
CS_02681.las	547,515,832	29,445,170	1,299,972	9,824	578,270,798
CS_02685.las	583,786,708	2,699,246	50,035	420	586,536,409
CS_02688.las	315,567,222	17,100,147	1,124,638	12,171	333,804,178
CS_02693.las	51,010,963	387,042	5,469	27	51,403,501
CS_02695.las	565,156,234	16,941,298	309,403	859	582,407,794
CS_02699.las	70,193,398	1,181,285	3,915	00	71,378,598
CS_02700.las	83,738,088	2,387,264	52,385	1,794	86,179,531
CS_02710.las	94,393,014	11,019,201	2,035,216	202,179	107,649,610
CS_02713.las	611,887,588	5,160,702	35,205	143	617,083,638
CS_02714.las	638,415,693	6,046,744	72,024	916	644,535,377
CS_02715.las	605,451,356	5,543,758	58,427	1,526	611,055,067
CS_02718.las	604,984,453	7,582,212	57,453	442	612,624,560

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CS_02722.las	481,902,242	20,479,571	2,612,370	215,477	505,209,660
CS_02727.las	532,656,256	25,324,484	1,264,503	12,802	559,258,045
CS_02731.las	589,118,733	2,211,956	19,259	56	591,350,004
CS_02739.las	94,328,844	1,119,873	5,364	07	95,454,088
CS_02740.las	561,740,665	13,108,622	234,839	778	575,084,904
CS_02743.las	68,242,966	1,453,023	6,771	00	69,702,760
CS_02744.las	96,171,852	2,363,917	43,333	1,022	98,580,124
CS_02748.las	129,002,306	21,529,858	2,209,454	58,295	152,799,913
CS_02755.las	86,455,808	13,312,464	2,475,704	238,497	102,482,473
CS_02758.las	687,663,822	5,938,964	40,377	302	693,643,465
CS_02759.las	625,850,069	6,171,895	97,922	1,981	632,121,867
CS_02760.las	642,525,153	6,518,613	64,468	1,226	649,109,460
CS_02763.las	633,933,193	8,322,485	80,516	889	642,337,083
CS_02765.las	227,984,456	3,119,103	49,875	169	231,153,603
CS_02767.las	465,491,865	21,081,835	2,109,167	99,234	488,782,101
CS_02772.las	552,724,775	20,714,793	915,144	9,985	574,364,697
CS_02776.las	573,956,797	2,392,982	35,316	220	576,385,315
CS_02783.las	49,951,137	848,634	5,160	02	50,804,933
CS_02784.las	574,513,406	11,639,087	177,401	750	586,330,644
CS_02789.las	82,026,325	2,665,431	103,202	4,656	84,799,614
CS_02802.las	612,440,853	6,111,149	73,871	1,062	618,626,935
CS_02805.las	605,049,938	7,268,686	72,294	812	612,391,730
CS_02807.las	280,548,310	4,421,243	61,675	302	285,031,530
CS_02814.las	532,631,308	19,051,385	622,493	3,783	552,308,969
CS_02818.las	402,814,522	1,792,835	17,529	52	404,624,938
CS_02821.las	154,513,574	1,061,750	30,414	140	155,605,878
CS_02824.las	53,896,020	951,320	6,310	04	54,853,654
CS_02828.las	47,166,398	410,750	418	00	47,577,566
CS_02843.las	648,784,878	6,966,145	65,658	596	655,817,277
CS_02844.las	622,721,743	6,267,748	55,036	768	629,045,295
CS_02846.las	628,613,734	9,219,920	145,410	2,300	637,981,364
CS_02852.las	529,400,938	15,527,895	367,987	1,389	545,298,209
CS_02858.las	533,005,708	2,990,083	53,811	374	536,049,976
CS_02882.las	328,509,748	5,472,181	47,672	100	334,029,701

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<u>File</u>	<u>First return</u>	<u>Second return</u>	<u>Third return</u>	<u>Other returns</u>	<u>Total points</u>
CS_02887.las	532,251,682	12,566,799	268,652	1,255	545,088,388
CS_02893.las	526,712,762	5,023,733	101,856	451	531,838,802
CS_02895.las	532,753,895	16,600,946	448,445	2,091	549,805,377
CS_02898.las	39,280,852	390,257	524	00	39,671,633
CS_02925.las	29,683,010	642,965	5,494	13	30,331,482
CS_02937.las	313,665,212	6,164,872	50,294	110	319,880,488
CS_02938.las	500,904,841	17,972,834	1,409,155	58,222	520,345,052
CS_02957.las	389,342,763	7,372,692	79,046	259	396,794,760
CS_02983.las	3,695,772	44,566	221	00	3,740,559
CS_03027.las	66,993,780	4,234,489	113,066	393	71,341,728
CS_03041.las	274,338,343	4,206,165	49,605	186	278,594,299
CS_03042.las	523,822,827	12,541,173	591,385	23,674	536,979,059
Total	62,622,126,246	1,587,443,288	105,182,074	6,553,292	64,321,304,900